U. S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Samoana fragilis*

COMMON NAME: Fragile tree snail, or akaleha

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: September 2005

STATUS/ACTION:

____ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

____ New candidate

_X_ Continuing candidate

____ Non-petitioned

_X_ Petitioned - Date petition received: May 11, 2004

____ 90-day positive - FR date:

_X__ 12-month warranted but precluded - FR date: May 11, 2005

__N_ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? _yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? _yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions. During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov

____ Listing priority change

Former LP: ____

New LP: ____

Date when the species first became a Candidate (as currently defined): November 15, 1994

____ Candidate removal: Former LP: ____

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Snails; Family Partulidae (snail)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Guam; Commonwealth of the Northern Mariana Islands (island of Rota)

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Guam; Commonwealth of the Northern Mariana Islands (island of Rota)

LAND OWNERSHIP
Six of the eight sites are on lands owned by private land owners. The other two sites are on U.S. Fish and Wildlife Service Refuge overlay lands owned by the U.S. Military.

LEAD REGION CONTACT: Paul Phifer (503) 872-2823, paul_phifer@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Lorena Wada (808) 792-9400, lorena_wada@fws.gov

BIOLOGICAL INFORMATION
Species Description: The conical shell of this snail is 12 to 16 millimeters (mm) (0.5 to 0.6 inches (in)) long, 10 to 12 mm (0.4 to 0.5 in) wide, and is formed by four whorls that spiral to the right. The common name is derived from the thin, semi-transparent nature of the shell. The shell has delicate spiral striations intersected by transverse growth striations. The background color is buff, tinted by narrow darker maculations and whitish banding that are derived from the internal organs of the animal that are visible through the shell. The fragile tree snail exhibits two reproductive characteristics, which are unique among the Mariana Islands' partulid snails. Adults attain sexual maturity before reaching either maximum shell size (Crampton 1925), and have relatively large eggs (3.3 to 4.3 mm (0.13 to 0.16 in) that are encapsulated in a tough, calcareous shell (Crampton 1925). These egg shells are reabsorbed and the snail gives birth to live young. In general, partulid snails begin reproducing in less than 12 months and may live up to 5 years. Up to 18 young are produced each year. The snails are generally nocturnal, live on bushes or trees and feed on decaying plant material. There are no known native predators of

these snails, although many of these species are now currently threatened by nonnative snail predators.

Taxonomy: The three genera and 123 tree snail species of the family Partulidae are restricted to the high-elevation Pacific islands of Polynesia (excluding Hawaii), Melanesia, and Micronesia (Cowie 1992; Paulay 1994). The Mariana archipelago historically supported five species of partulid tree snails and represents the northwestern limit of the geographical range of the Partulidae. The genus *Samoana* is represented in the Mariana Islands by a single species, the fragile tree snail (*Samoana fragilis*). The fragile tree snail was first collected on Guam in 1819 by Quoy and Gaimard during the Freycinet Uranie expedition of 1817 to 1819 (Crampton 1925). Crampton's 1925 taxonomic write up for this species is the most recent and accepted taxonomy for this species.

Habitat: The fragile tree snail prefers cool, shaded forest habitats (Crampton 1925; Cowie 1992; Smith 1995) with high humidity and reduced air movement that might otherwise lead to excessive water loss..

Historic and Current Range/Distribution: The fragile tree snail is the only member of the genus *Samoana* to occur outside southeastern Polynesia. In the Mariana Islands, it has been reported from Guam and Rota. When it was first discovered, it was considered to be rare but widespread (Crampton 1925).

In 1920, Crampton (1925) documented fragile tree snails from 13 sites on Guam. In 1989, Hopper and Smith (1992) resurveyed Crampton's original sites plus several more. At that time they found only six sites still supporting fragile tree snails. Recent survey data indicates that the fragile tree snail has not been seen on Guam since 1996 (B.D. Smith, University of Guam, pers. comm. 1998). Kondo (1970) documented the 1959 discovery of the fragile tree snail on Rota by R.P. Owen. Surveys in 1952 (Kondo 1970) and 1992 (Smith 1995) produced no specimens. A 1996 survey on Rota identified a mixed population of humped and fragile tree snails (S. Miller, U.S. Fish and Wildlife Service, pers. comm. 1998) supporting about 100 fragile tree snails.

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range. The native tree snail habitat on the main islands of the Commonwealth of the Northern Mariana Islands has been greatly reduced by development and agricultural activities (Engbring *et al*. 1986). The only areas left undisturbed were too steep for agriculture, generally along the base of cliffs, which are an extensive geological feature of the island. These areas still support native limestone forests (Fosberg 1960).

In addition, typhoons are a common occurrence on Guam and Rota. Guam, for example, has been affected by typhoons in 37 of the last 50 years (based on records compiled by U.S. Navy, Joint Typhoon Warning Center). These storms have been known to defoliate forested areas and down trees which can impact tree snail populations. For example, in August of 2004, Typhoon Chaba stalled 25 miles north of Rota for several hours, downing trees and defoliating large sections of the forested areas, especially on the windward side of the island. Vegetation changes associated with this storm have opened up forested areas that were

excellent habitat for partulid tree snails. These open forests suffer from changes in microhabitat, such as desiccation, that make the continued survival of snails unlikely. These changes continue to occur today with each successive typhoon.

No conservation efforts are being undertaken to alleviate these threats for this species.

B. Over-utilization for commercial, recreational, scientific, or educational purposes. Over-utilization is not known to be a factor currently affecting any of the partulid tree snails from the Mariana Islands. Future over-utilization of this species is not anticipated.

C. Disease or predation.
Predation by the alien rosy carnivore snail (*Euglandina rosea*) and the alien Manokwar flatworm (*Platydemis manokwari*) is a serious threat to the survival of all four species of partulid tree snails from the Mariana Islands. The predatory rosy carnivore snail is native to the southeastern United States, and was introduced into the Mariana Islands in 1957 by the governments of Guam and the Commonwealth of the Northern Mariana Islands, following the recommendations of the State of Hawaii Department of Agriculture (Eldredge 1988). Since being introduced, this voracious predator of snails has been dispersed by humans throughout the main islands.

The rosy carnivore snail was imported to these and other Pacific islands as a biological control agent for another alien snail, the giant African snail (*Achatina fulica*), which is an agricultural pest. However, while its effectiveness as a biological control agent against the giant African snail is questionable (Meade 1961; Tillier and Clarke 1983; Christiansen 1984), field observations have established that the rosy carnivore snail will readily feed on native Pacific island tree snails, including the Partulidae such as those of the Mariana Islands (Tillier and Clarke 1983; Murray *et al*. 1988; Miller 1993) as well as Hawaiian achatinellid tree snails (Hadfield *et al*. 1993). A study of the diet of the rosy carnivore snail on the island of Mauritius in the Indian Ocean showed that this alien predator preferred native snails over the targeted alien giant African snail (Griffiths *et al*. 1993). On some or all of these tropical islands, the rosy carnivore snail has expanded its normal terrestrial feeding behavior to include native snails found in arboreal habitats (Murray *et al*. 1988; Hadfield *et al*. 1993; Miller 1993). The rosy carnivore snail has caused the extinction of many populations and species of native snails throughout the Pacific islands (Tillier and Clarke 1983; Murray *et al*. 1988; Hopper and Smith 1992; Hadfield *et al*. 1993; Miller 1993). Where it still resides, the rosy carnivore snail represents a significant threat to the survival of native Mariana Islands snails, including the four remaining partulid tree snails: the humped tree snail (*Partula gibba*), the Langford's tree snail (*Partula langfordi*), the Guam tree snail (*Partula radiolata*), and the fragile tree snail (*Samoana fragilis*).

Predation on native partulid tree snails by the terrestrial Manokwar flatworm is also a threat to the long-term survival of these snails. This voracious snail predator was introduced into Guam in 1978 and has been spread by humans throughout the main Mariana Islands (Eldredge 1988). It has proven to be an effective biological control agent for the giant African snail, but has also contributed to the decline of native tree snails, in part due to its ability to ascend into trees and bushes that support native snails. Areas with populations of

the flatworm usually lack partulid tree snails or have declining numbers of snails (Hopper and Smith 1992).

No conservation efforts are being undertaken to alleviate these threats for this species.

D. The inadequacy of existing regulatory mechanisms.
Currently, no formal or informal protection is given to the fragile tree snail by Federal agencies or by private individuals or groups. In 1996, the Government of Guam listed this species as endangered on Guam (5 GCA, Section 63205(c), "The Endangered Species Act of Guam"). The Guam law does not provide for the designation of critical habitat, and the endangered and threatened species list must be renewed by the legislature each year.

E. Other natural or manmade factors affecting its continued existence.
Even if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the small number of extant populations and the small geographic range of the known populations. This circumstance makes the species more vulnerable to extinction due to a variety of natural processes. Small populations are particularly vulnerable to reduced reproductive vigor caused by inbreeding depression, and they may suffer a loss of genetic variability over time due to random genetic drift, resulting in decreased evolutionary potential and ability to cope with environmental change (Lande 1988; Center for Conservation Update 1994). Naturally occurring random (i.e., stochastic) events can affect the continued existence of the fragile tree snail due to the small numbers of populations and individuals that remain. Stochastic physical events such as typhoons and droughts could eliminate one or more of the eight remaining populations. This is especially true due to several life-history features of this and all other partulid tree snails (Cowie 1992): reproductive rates are low; eggs are not laid as in most terrestrial snails, but the young are born live; dispersal is very limited with most individuals remaining in the tree or bush into which they were born. All of these traits make these snails very sensitive to any stochastic event that could lead to a reduction or loss of reproductive individuals.

No conservation efforts are being undertaken to alleviate these threats for this species.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED
The Guam Government Department of Agriculture (DOA) has listed the humped and fragile tree snails as endangered and the Pacific tree snail as threatened (see GovGuam DOA, Endangered Species Regulation 6, March 1992).

The Guam National Wildlife Refuge (Refuge) was created on October 1, 1993, with additional lands incorporated in 1994 by cooperative agreements between the Service, the U.S. Air Force, and the U.S. Navy. The establishment and management of the Refuge on U.S. Navy and U.S. Air Force land provide a commitment for a "coordinated program centered on the protection of endangered and threatened species and other native flora and fauna..." Enactment of such a program by these agencies will contribute to the continued survival and recovery of humped, Pacific, and fragile tree snails on Guam, as important snail habitat is found within the Refuge boundaries.

SUMMARY OF THREATS

The primary threats to this species are loss of habitat and predation from nonnative snails and flatworms. There are no conservation efforts being undertaken to alleviate these threats for this species.

LISTING PRIORITY:

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2 ***
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Rationale for listing priority number:

Magnitude:

This species is highly threatened by habitat loss and modification and by predation from nonnative predatory snails and flatworms. All of the threats occur range-wide and no efforts to control or eradicate the nonnative predatory snail species or to reduce habitat loss are being undertaken.

Imminence:

Threats to the fragile tree snail from habitat loss and modification and predation by nonnative predatory snails and flatworms are considered imminent because they are on-going.

Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? yes

Is Emergency Listing Warranted?

No. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. Additionally, the species is listed as threatened by

the Guam government and occurs within the National Wildlife Refuge overlay. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *Samoana fragilis* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING:

We conducted literature searches for recent articles on this species and contacted species experts, CMNI Division of Fish and Wildlife, and University of Hawaii and University of Guam researchers regarding the current status of this species. No additional information on the species' status was found. However, the existing data regarding the species' status was verified.

This level of monitoring is appropriate to update the status of the species because a thorough literature search was conducted as well as relevant species experts contacted. Information contained in this assessment form was verified and any updated information incorporated. This species is listed as critically endangered in the International Union for Conservation of Nature and Natural Resources Red Data List database (International Union for Conservation of Nature and Natural Resources database 2004).

List of Experts Contacted:

Name	Date	Place of Employment
Blaine Dicke	March 03, 2005	Guam Division of Aquatic and Wildlife Resources
Aubrey Moore	March 03, 2005	University of Guam
Ross Miller	March 03, 2005	University of Guam
Barry Smith	March 03, 2005 & July 11, 2005	University of Guam
Laura Williams	July 11, 2005	CNMI Division of Fish and Wildlife, Saipan
Robert Cowie	July 11, 2005	University of Hawaii
Anne Brooke	Sept. 20, 2005	U.S. Fish and Wildlife Service

List of Databases Searched:

Name	Date
International Union for Conservation of Nature and Natural Resources	2004

COORDINTATION WITH STATES:

We contacted CNMI Division of Fish and Wildlife by email with a request for any information on the species and sent copies of our candidate forms. No response was received. We also contacted Guam Division of Aquatic and Wildlife Resources. They informed us that they had no additional information.

LITERATURE CITED

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Crampton, H.E. 1925. Studies on the variation, distribution, and evolution of the genus *Partula*. The species of the Mariana Islands, Guam and Saipan. Carnegie Inst. Wash. Publ. 228A. vii + 116pp., 14 pl.

Eldredge, L.G. 1988. Case studies of the impacts of introduced animal species on renewable resources in the U.S.-affiliated Pacific islands. pp. 118-146. In B.D. Smith (ed.), Topic reviews in insular resource development and management in the Pacific U.S.- affiliated islands. Univ. Guam Marine Lab. Tech. Rep. 88.

Engbring, J. F. Ramsey, and V. J. Wildman. 1986. Micronesain Forest Bird Survey, 1982: Saipan, Tinian, Agiguan, and Rota. U.S. Fish and Wildlife Service, Honolulu, HI. 143 pp.

Fancy, S.G. and T.J. Snetsinger. 1996. Potential reasons for the decline of the bridled white-eye population on Rota, Mariana Islands. Unpublished report, U.S.G.S., Biological Resources Division, Pacific Islands Ecosystems Research Center, Hawaii National Park, Hawaii.

Griffiths, O., A. Cook, and S.M. Wells. 1993. The diet of the introduced carnivorous snail *Euglandina rosea* and its implications for threatened island gastropod faunas. Journal of Zoology, 229:79-89.

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Lande, R. 1988. Demographic models of the northern spotted owl (*Strix occidentalis caurina*). Oecologia 75: 601-607.

Miller, S.E. 1993. Final report on surveys of the arboreal and terrestrial snail fauna of American Samoa. Unpublished report submitted to U.S. Fish and Wildlife Service, Pacific Region, Honolulu. 30 pp.

Murray, J., E. Murray, M.S. Johnson, and B. Clarke. 1988. The extinction of *Partula* on Moorea. Pacific Sci. 42:150-153.

Paulay, G. 1994. Biodiversity on oceanic islands: Its origin and extinction. Am. Zoologist 34:134-144.

Smith, B.D. 1995. Tree snails, tropical storms, and drought in the Mariana Islands. (Abstract only). Programs and abstracts, American Malacological Union, 61st Annual Meeting, Hilo, Hawaii.

Tillier, S. and B.C. Clarke. 1983. Lutte biologique et destruction du patrimoine genetique: le cas du mollusgues gasteropodes pulmones dans les territoires Francais du Pacifique. Sel. Evol., 15:559-566.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: Acting _____ 11/16/05
Regional Director, Fish and Wildlife Service Date

Concur: _____ August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Date of annual review: 7/21/05
Conducted by: Lorena Wada, Pacific Islands FWO

Comments:

PIFWO Review
Reviewed by: Gina Shultz _____ Date: 10/12/05
Assistant Field Supervisor, Endangered Species

Patrick Leonard _____ Date: 10/11/05
Field Supervisor